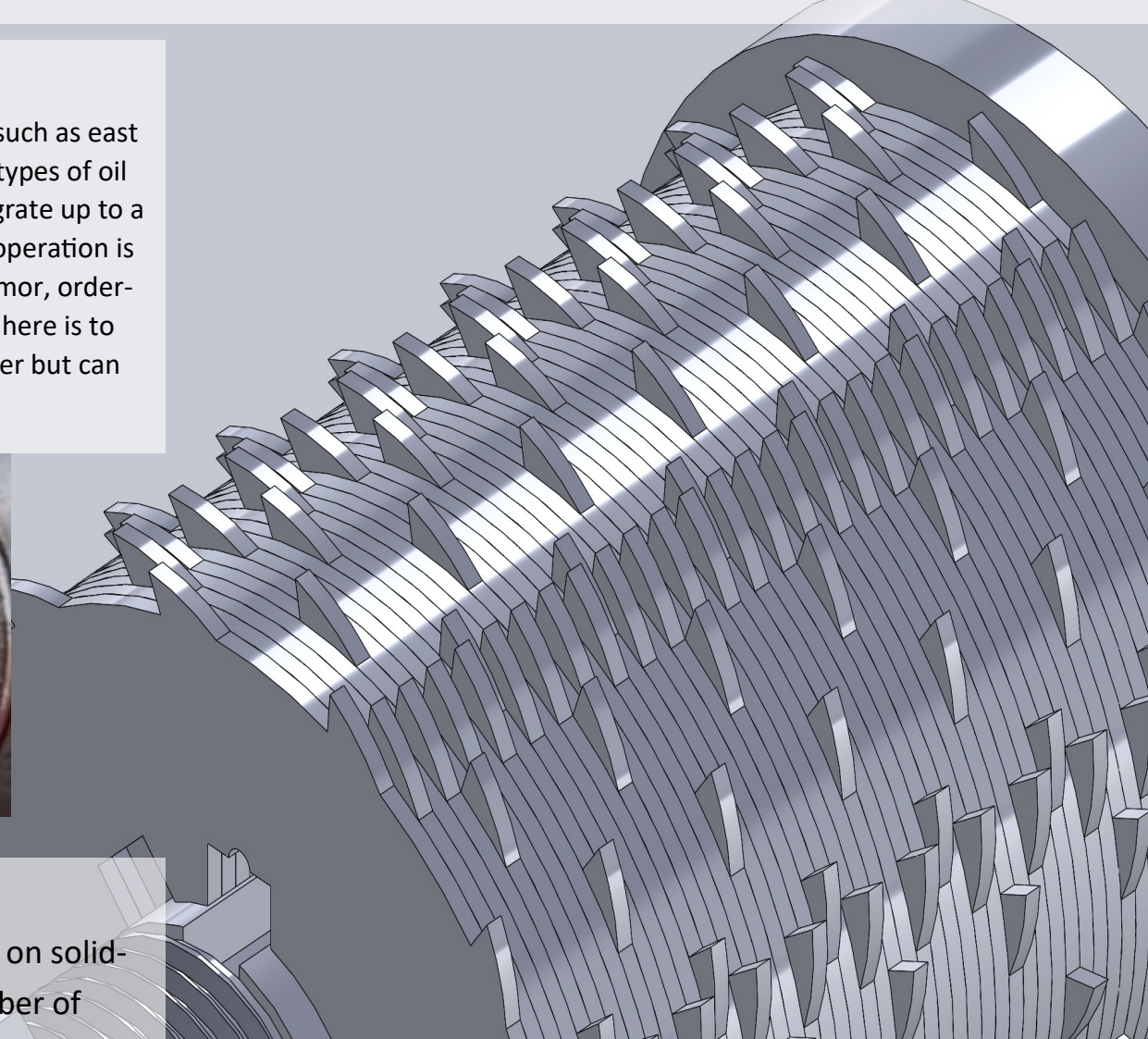


# Coconut meat shredder for small industrial use

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## Introduction

Grated coconut makes up a huge dietary portion of most people in Asian and Pacific regions, such as East Timor. Some people consume it as grated and some convert the grated coconut into various types of oil products at commercial level. The existing grater (Figure below) for commercial purpose can grate up to a few thousand of coconuts a day, however, the life spans of this grater for such a continuous operation is about four to six months and it requires replacing the entire cylinder at a huge cost. In East Timor, ordering a new set from overseas would take about 2 to 3 months to arrive. The ultimate objective here is to design and test a new shredder set that would last for a year and more, and not only last longer but can also be sharpened and replace an individual disc.



## Design process and prototyping of discs.

To achieve the objective above, a less than 1mm thick disc is carefully designed on SolidWorks and manufactured for prototype testing. This disc will have a certain number of teeth and depth of teeth. For this experiment, a 0.9 mm thick disc of 50mm in diameter with 12 teeth at the depth of 2mm (Figure 2) is chosen, water jetted and tested to be an option. Prior to this, several different teeth depth designs were laser cut on MDF for visual checks and feels. And out of those options, 2mm deep was suitable for testing. A set of 50 discs was water jetted, offset the teeth on a shaft and nutted together and fitted in a housing as shown in Figure 4.

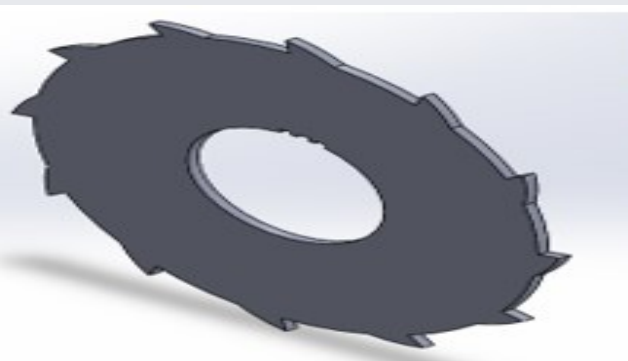


Figure 2, 2mm deep disc shredder



Figure 3a, 50 discs are sandwiched



Figure 4 Housing made of clear acrylic with the disc set

## Testing process

The first couple of tests were done on carrots but it was difficult to compare with grated coconut as carrots have different properties. The next two cycles of testing were on coconut, and some good and bad discoveries during tests.



Figure 7 New design cuts (top), original shredder cuts with strips (bottom)

## Findings during testing and remedies

During the testing, bagging sound was observed at each end of carrot going through the grater. This was also the case during a brief test run on coconut. This was partially due to the teeth offsets that left a gap of about 10mm from pitch to pitch along the shaft, this can be seen in Figure 5 left. To avoid this, a new sequential offset was modeled by cutting 3 keyways instead of 2 into the disc. Discs offset is detailed in Figure 5 right. And during the testing of the cycles, the noise reduced significantly.

Alongside with the bagging, clogging also occurred in the teeth. Research was done into this clogging and it appears the surface speed of the 50mm diameter is three times as slow as the 200mm diameter conventional grater. Having said that this could also be caused by disc offsets. More testing needs to be carried out to address this problem.

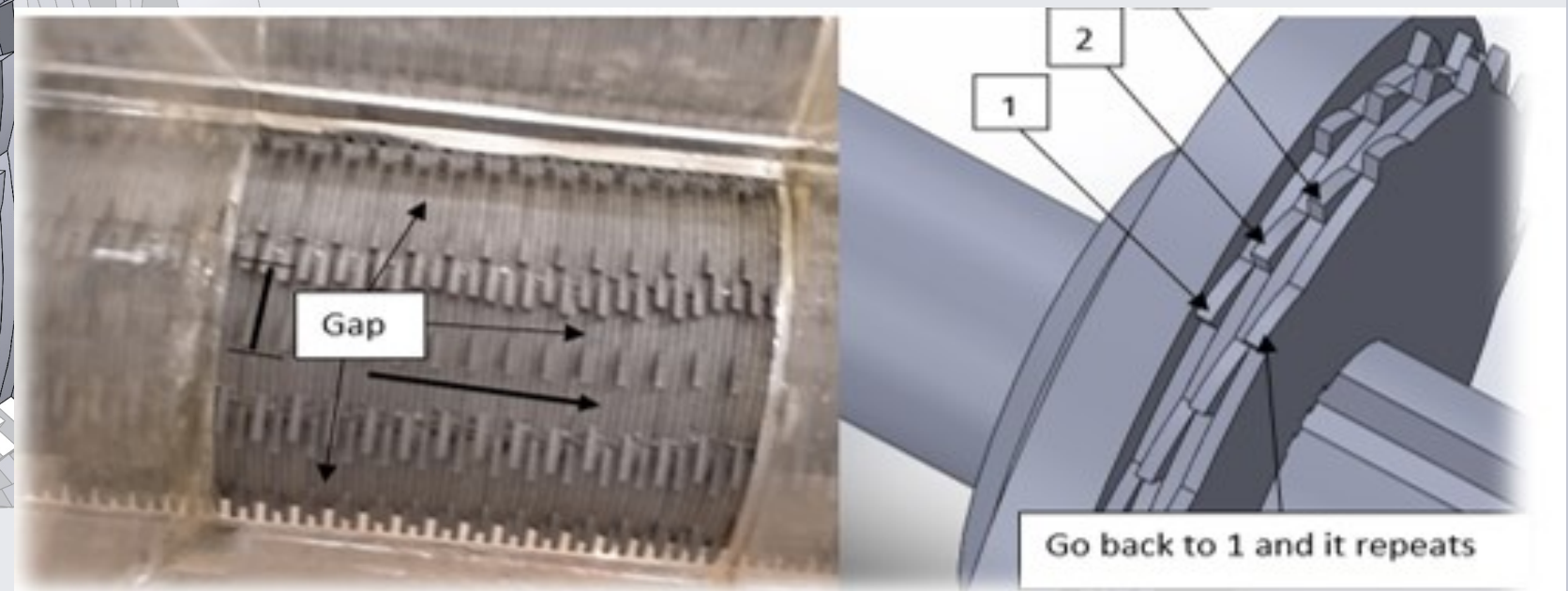


Figure 5 Pitch gaps (left), teeth offset (right)

## Results and conclusions

Outcomes of this project prototyping show that sandwiching discs together with 2mm deep teeth design for grating coconut has proven to be working. It grates just as good as the existing graters with better features such as, blades can be replaced individually if required. Moreover, further research and redesign can be done to make it possible and easier to sharpen the blades. Of course, not to overlook the fact that clogging can occur with the current designs with teeth offsets.

## Recommendations

Redesign the teeth in a way to avoid clogging.

More testing required, especially on less than 2mm depth teeth, 1mm or 1.5mm preferably.

Build a strong and stable housing for a consistent grating results for comparison of each disc offset cuts.

Make a mould for compressing the mill of each different cut.

Experimenting on a stable cutting speed.